

Discrimination of mangrove vegetation habitat types (Northeast Brazil) using CBERS-2B images and the Normalized Difference Vegetation Index (NDVI)

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Abstract

Mangrove forests constitute one of the major coastal vegetations of the (sub) tropics and have been widely studied by remote sensing. The images from the Brazil Earth Resources Satellite (CBERS) constitute a new and freely remote sense tool for the monitoring of mangroves. In this study we discriminated mangrove vegetation habitats of the São Francisco River Estuary (Northeast Brazil) and estimate their canopy closure using CBERS images and the normalized difference vegetation index (NDVI). The CBERS-2B images (2008) were pre-processed (radiometric, atmospheric and geometric corrections) and then, used to calculate the NDVI. Multiple classes of mangrove habitats were discriminated based on NDVI values, qualitative field data and visual interpretation of a high resolution (2.5 m) color composite of satellite images (CBERS-2B and SPOT-5). The canopy closure percent was estimated based on the minimum and maximum NDVI values recorded for the mangrove vegetation. Four habitat types within the mangrove vegetation were discriminated. Habitat type 1 ($0.2 \leq \text{NDVI} < 0.3$) shows canopy closure from 0% to 25% and mangroves with exposed sediment, herbaceous vegetation (*Juncus* sp.) and *Acrostichum aureum* patches. Habitat type 2 ($0.3 \leq \text{NDVI} < 0.45$), with canopy closure from 25% to 50%, shows sparse mangrove. Habitat type 3 ($0.45 \leq \text{NDVI} < 0.57$), with canopy closure from 50% to 75%, exhibits dense canopy cover, but with small gaps or spaces, a high occurrence of *Rhizophora mangle* trees, and it constitutes the dominant habitat in the study area. Habitat type 4 ($0.57 \leq \text{NDVI} < 0.64$), with canopy closure from 75% to 100%, showed dense canopy cover without gaps/spaces and occurrence of dense patches of *A. aureum* within the true mangrove vegetation. We concluded that the use of CBERS images and NDVI is a good remote sensing method for assessing the spatial arrangement of mangrove canopy and can be used to discriminate different types within mangrove vegetations *sensu lato*.

Keywords

remote sensing, wetland, vegetation assessment, satellite image, GIS